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NYASALAND PROTECTORATE

COMMONWEALTH MYCOLOGICAL INSTITUTE 3-OCT. 1949 SURREY

Report of the Department of Agriculture For the year 1947

PART II.—EXPERIMENTAL WORK

Shortage of staff and labour once again curtailed the development of research work, but it was possible to maintain all long range experiments, and in a few instances increase the range of investigations.

TUNG

SENIOR AGRICULTURAL OFFICER IN CHARGE: C. C. WEBSTER

Tung Experimental Station, Cholo

1. Acute shortage of labour, especially during the important time early in the rainy season, again handicapped the work of this station. The efficiency of field experiments was impaired because it was often not possible to carry out the necessary cultivations at the proper time and some of the clones of buddings under trial most probably did not give the yields of which they are potentially capable. In the 1946-47 season it was again impossible to extend the experimental acreage but a small new area was planted in the following season.

Selection of Promising Mother Trees.

2. The main line of work at the station continued to be the production of improved planting material of *Aleurites montana* by the selection of outstanding mother trees and their vegetative propagation on seedling rootstocks. The survey of seedling plantations on estates was not extended but a number of the younger fields were re-examined and further promising trees selected. More attention is being paid to the habit of growth and branching with a view to finding high yielders with a habit which will facilitate the use of tractors for cultivation in plantations.

Vegetative Propagation as Buddings.

3. A further 32 new clones were planted in preliminary clone trials, bringing the total number of clones now being tested at the station to 100. Trials of budding in various experiments and observation plots, both at the station and on estates, have continued to give interesting results from the older clones but the yields in general have been adversely affected by lack of cultivation and/or manuring.

Buddings versus Seedlings.

4. Two of the earliest trials, both dating from the later part of 1940, effect a direct comparison between buddings and seedlings. The first of these is a small randomised block experiment, the yields of which are given in Table 1. for the years 1946 and 1947. Yields had increased fairly steadily up to 1946 and buddings had proved significantly superior to seedlings every year, except in 1945 when the whole crop was destroyed by hail, but this season yields have fallen and the difference between the two treatments is less than before although still just significant. This is not attributed to any real tendency of buddings towards an early decline in yield (c.f. yields from buddings in subsequent paragraphs) but simply to the effect of lack of cultivation and manuring of the rather poor soil on which this trial is situated.

TABLE 1. LBS. AIR-DRIED, HULLED SEED

Year	Buddings		Seedlings		Sig. diff. per tree	
	Per tree	Per acre *	Per tree	Per acre *	P=0.05	P=0.01
1946	13.8	1,103	6.6	530	3.6	5.2
1947	8.4	672	5.6	448	2.6	3.7

* Trees planted at 25 ft. hexagonal = 80 per acre.

5. The second trial, which was planted at the experimental station in December, 1940, compares unselected seedlings derived from ordinary bulk seed, " selected seedlings " raised from open pollinated

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seed taken from four selected trees, and buddings from the same four trees on both *fordii* and *montana* seedling stocks. The yields and girth measurements for 1947, shown in Table 2., indicate the same results as have been obtained for the past four years. The buddings on *montana* stock have significantly outyielded all other treatments and those on *fordii* stock are better than unselected seedlings but not better than selected seedlings. The seedling trees continue to be more vigorous than the buddings and the *fordii* stock to exert a dwarfing effect as compared with the *montana*.

TABLE 2. YIELDS IN LBS. AIR-DRIED, HULLED SEED PER TREE

Year	Age		Buddings		Seedlings		Sig. diff. per tree	
			Montana stock	Fordii stock	Selected	Unselected	P=0.05	P=0.01
1946 ...	5	per tree	9.3	6.2	4.6	4.4	1.78	2.46
		per acre*	521	349	257	246	—	—
1947 ...	6	per tree	14.7	8.0	7.4	6.3	3.22	4.45
		per acre*	823	448	414	353	—	—
1947 ...	6½	Girth inches	21.4	18.2	25.3	24.7	1.33	1.84

* Trees planted 28 ft. square = 56 per acre.

Clone Trials.

6. The 1947 yields from experiments and observation plots in which various clones of buddings are compared have been markedly influenced by the degree of cultivation given and the nutrient status of the soil, some trials having continued to show increased yields while others, particularly on estates, have declined as result of unchecked weed growth and lack of nitrogen. The yields of the four clones on *montana* stocks from the trial just described, which are shown in Table 3, have shown moderate increases but, rather unexpectedly, the clone ZM13, which has proved itself superior to the other three in other tirals, has here failed to show itself significantly better than any clone except the inferior ZF9. The yields from the five clones in the budded plots of the trial described in para. 4 above (Table 4) were less from all clones than last year which, as already mentioned, is considered to be due to lack of cultivation and soil deterioration. The clone ZM13 has again given the highest yield and is significantly better than all other clones except ZM8.

TABLE 3. LBS. AIR-DRIED SEED PER TREE

Year	Age		Clones				Sig. diff. per tree	
			ZM8	ZM13	ZH14	ZF9	P=0.05	P=0.01
1946 ...	5	per tree	9.8	11.2	9.8	6.6	1.61	2.11
		per acre*	549	627	549	370	—	—
1947 ...	6	per tree	14.8	16.9	14.7	11.9	4.01	5.27
		per acre*	829	946	823	666	—	—

* Trees planted at 28 ft. square = 56 trees per acre.

TABLE 4. YIELDS, LBS. AIR-DRIED HULLED SEED

Year	Age		Clones					Sig. diff. per tree	
			ZM8	ZM13	ZN24	ZN10	ZF9	P=0.05	P=0.01
1946 ..	5	per tree	14.6	20.2	10.0	9.4	14.7	7.5	9.9
		per acre*	1,168	1,616	800	752	1,175	—	—
1947 ..	6	per tree	8.8	12.9	5.7	7.8	6.7	4.23	5.56
		per acre*	704	1,032	456	624	536	—	—

* Trees planted at 25 ft. hexagonal = 80 trees per acre.

7. Further evidence of the very marked effect of cultural conditions on the yields of buddings is provided by two identical 6×6 Latin Square clone trials which were established on two estates in the 1942-43 season. It will be noticed that the two trials gave very similar yields in 1946 for each of the first four clones listed in Table 5. but in the following season yields at Estate B were approximately double those of Estate A. This is partly due to the rather better soil of estate B but a more important factor is the higher standard of cultivation there as compared with estate A. The very poor performance at estate A of the quick cropping B type clones, Nos. 14 and ZO4 is not fully understood and may be due to lack of pollination. The most notable feature of the yield records is the good performance of the clone ZC2A.

TABLE 5. YIELDS, LBS. AIR-DRIED HULLED SEED

Trial	ESTATE A				ESTATE B			
Year	1946		1947		1946		1947	
Age years	5		6		5		6	
CLONE	per tree	per acre*	per tree	per acre*	per tree	per acre*	per tree	per acre*
ZM13	4.8	269	8.0	448	4.9	274	16.7	935
ZN24	3.8	213	6.9	386	4.4	246	13.7	767
ZC2A	9.2	515	10.2	571	11.3	633	22.2	1,243
B741	4.3	241	8.3	465	4.7	263	16.6	930
14	2.2	123	3.0	168	16.6	930	24.1	1,350
ZO4	3.7	207	5.6	314	12.0	672	20.5	1,148
Sig. diff. P=0.05 ...	2.3		3.7		2.7		5.9	
Sig. diff. P=0.01 ...	3.2		5.0		3.8		8.1	

* Trees planted at 30 ft. hexagonal = 56 per acre.

8. The average yields of the five clones in the intercropping experiment at the station (see para. 11) are shown in Table 8, the averages for all plots and for the soya plots only being shown separately. While the average yields for the whole experiment have increased for every clone, it will be noticed that there have been slight decreases this year for three clones when the yields from the soya plots only are considered. This is believed to be due to the fact that no cultivation beyond slashing the grass and weeds was given this season and it is probable that yields will again rise when cultivation is improved. As in all previous years, the two B type clones, Nos. 10 and 14, have again given significantly better yields than any of the other three and the clone ZF9 is again the poorest cropper. Adjacent to this trial in the same field there is a block of 200 selected seedlings (derived from open pollinated seed taken from good trees) which were planted at the same time and it is of some interest to compare the yields of Table 8 with those from this seedling block, which were 7.0 lbs. dry seed per tree in 1946 and 8.5 lbs. in 1947.

9. Records were again obtained from a number of observation plots of buddings at Kamponje Estate and are shown in Table 6. In 1946 the yields of these trees were very much reduced by a damaging hail storm early in the season and it was expected that this year's crop would be substantially greater than that for 1945. This has not generally obtained and in fact the sixth year's yield is actually less than the fourth year's in 5 of the 12 cases listed. It is believed that the light soils of this estate, which were used for annual crops before tung was planted, are now lacking in nitrogen and it is probable that the yields from these clones will decline unless manure is applied.

TABLE 6. LBS. AIR-DRIED, HULLED SEED

Field		A			B			C	D	E		F	
Clone		ZO22	ZO23	14	ZH14	ZM8	ZK3	10	M13	14	ZH14	ZM13	ZM8
No. of trees		20	19	20	10	19	13	20	12	83	28	91	10
Year	Age												
1943	2 ...	4.0	5.1	7.8	2.9	2.4	2.8	4.5	9.6	—	—	—	—
1944	3 ...	2.9	4.0	4.6	2.2	2.4	5.8	1.3	4.1	—	—	—	—
1945	4 ...	10.3	11.6	16.0	14.3	12.4	22.4	12.4	21.5	22.5	17.2	13.7	5.4
1946	5 ...	2.9	5.5	7.0	4.7	3.8	8.3	3.0	7.8	6.1	5.2	4.3	2.6
1947	6 ...	11.7	10.3	11.8	15.5	15.6	29.3	13.6	8.2	15.6	15.6	29.7	9.5

10. This year's results have thus brought out clearly the need for good cultivation and the maintenance of soil fertility if good budded clones are to give the yields of which they are potentially capable.

These desiderata had not been lost sight of, as it was only to be expected that the best results would only be obtained from improved planting material under good cultural conditions, but shortage of labour and difficulty in obtaining fertilisers have rendered these conditions temporarily unattainable. As a result, rather less information than expected is available from the clone trials. Four clones can now be recommended with some confidence : ZM13 and ZC2A amongst the more vigorous and slower maturing " A " types, and Nos. 10 and 14 amongst the smaller quick cropping " B " types. In addition, B741 (A) and ZO4 (B) are very promising. Amongst the large number of newer clones which are not yet properly in bearing it is expected that some good material will be found. It is not yet possible to say whether the " A " or " B " types will prove most useful in the long run.

CULTURAL AND MANURIAL EXPERIMENTS

11. The oldest experiment in this category, which was planted in December, 1940, compared intercropping during the first four rainy seasons with (*a*) soya beans ; plants removed when harvesting beans, (*b*) maize, trash buried after harvest ; (*c*) green manure crop of velvet beans dug in annually ; (*d*) cover crop of *Calapogonium mucunoides*, intended to be permanent but which died out after the fourth season owing to failure to set seed. The main plots of this trial are divided to provide for a comparison of

five clones, the yields of which are shown in Table 8 and have been mentioned in para. 8 above. The yields and girth measurements for the four cultural treatments for 1946 and 1947 are shown in Table 7. Although intercropping has not been done since the 1943–44 rainy season, and although the standard of cultivation has since been low, the plots formerly intercropped with soya beans are still giving significantly better yields, and making stronger growth, than the other treatments. Thus the benefit of thorough cultivation during the early years with an intercrop which takes little from the soil is remarkably lasting in its effect.

TABLE 7

Year	Age		Treatments				Sig. diff. per tree	
			Soya	Maize	Velvet	Calapog.	P=0.05	P=0.01
Yields	*lbs.*	*dry seed*						
1946 ...	5	per tree	17.5	11.1	10.2	12.0	1.90	2.63
		per acre	980	622	571	672		
1947 ...	6	per tree	17.0	14.4	13.3	11.6	2.38	3.29
		per acre	952	806	745	650		
Girth, inches								
1946 ...	$5\frac{1}{2}$		19.9	19.1	17.9	17.3	1.52	2.10
1947 ...	$6\frac{1}{2}$		22.3	21.4	20.4	19.8	1.20	1.66

TABLE 8, LBS. AIR-DRIED HULLED SEED

Year	Age	Clones										Sig. diff. per tree	
		ZN24		ZM8		14		ZF9		10			
		per tree	per acre	per tree	per acre	per tree	per acre	per tree	per acre	per tree	per acre	P= 0.05	P= 0.01
All plots													
1946 ...	5	10.1	566	9.5	532	16.4	917	7.7	437	19.8	1,108	2.00	2.63
1947 ...	6	10.5	588	12.2	683	17.7	981	9.2	515	20.9	1,170		
Soya plots only													
1946 ...	5	14.6	817	10.7	599	23.5	1,315	11.2	627	27.6	1,546	2.83	3.72
1947 ...	6	13.9	768	15.2	841	21.3	1,183	12.0	662	22.7	1,261		

12. Two manurial experiments were begun at the station in the 1946–47 season with trees planted in December, 1943. One is a factorial fertiliser trial comparing the effect of nitrogen, phosphate and potash alone and in all combinations. No effect of the fertilisers on crop was to be expected in the first season but nitrogen (applied as 2 lbs. of sulphate of ammonia per tree or 1 cwt. per acre) significantly increased growth as indicated by the girth of the trunk three inches above the union. In the second experiment various organic manures—farmyard manure, cotton seed, and tung cake—are compared with a complete artificial fertiliser mixture and no manure. In this trial tung cake, which probably provided more nitrogen than any other treatment, also gave a significant increase in girth as compared with the no-manure plots. In view of the fact that there is a good deal of evidence to show that lack of nitrogen is limiting yields and growth on estates, the results of these manurial trials should be of considerable interest.

MISCELLANEOUS

13. A number of other investigations are in progress but are not yet at a stage at which there is anything very definite to report. These include a second intercropping trial, the observation of " legitimate seedling families " produced by selfing, or crossing between, selected high yielding trees ; the trial of clonal seedlings produced as a result of cross pollination in isolated gardens of buddings, a spacing trial, and small scale work on vegetative propagation by cuttings.

SOUTHERN PROVINCE

SENIOR AGRICULTURAL OFFICER—A. P. S. FORBES

EXPERIMENT STATION MLANJE

AGRICULTURAL OFFICER IN CHARGE.—H. W. T. WEBB

1. Down Pruning Old Tea 1944 (Ruo Estate).

This experiment was laid down on Ruo Estate in 1944 to investigate the present and other possible methods of treating down pruned old China Jat tea. The layout is a randomised block design with four treatments replicated six times. Fortnightly records of leaf yields were made. The complete sequence of tipping and pruning treatments is as follows :—

(1) Prune down to 14 inches and then tip to 27 inches ; cut across the following year to 22 inches and tip to 26 inches ; prune the next year to 20 inches tipping at 4 inches and prune up to 2 inches yearly tipping at 4 inches.

(2) Prune down to 14 inches and then tip at 27 inches ; prune up yearly 1 inch tipping at 27 inches until 18 inches pruning level is reached and then tip to 4 inches yearly.

(3) Prune 14 inches, tip 27 inches ; prune 24 inches tip 28 inches ; prune down yearly inch by inch until 20 inches is reached tipping 4 inches up each year ; thereupon prune up 1 inch yearly until 24 inches is reached, tipping 4 inches yearly.

(4) Prune 14 inches and tip 18 inches ; prune up 1 inch yearly and tip at 4 inches.

YIELD RECORDS 1946–47 SEASON RECORDED FORTNIGHTLY

Treatment	1	2	3	4	*Sig. difference* $P=0.05$	$P=0.01$
Yield per acre in lbs. made Tea ...	598	482	599	645	105	

Results.

The first two seasons of this experiment showed no significant difference between treatments. During the season under review treatments 1, 3, and 4 gave significantly higher yields than treatment 2. Treatment 4 for the third season in succession gave the highest yield.

Treatment 4 though not significantly superior to treatments 1 and 3 has given the highest yields during the three years of the experiment. Treatment 4 has a further advantage in that it permits an appreciable lengthening of the period between down prunings.

This experiment confirms indications obtained in other investigations that less crop is lost by tipping low. The favourable results obtained from treatment 4 is in conformity with results obtained in N. India.

2. Tipping Levels of China Jat Tea and Influence of Pruning Methods on Tipping 1944 (Ruo Estate).

A previous experiment investigating the influence of the height of tipping on the yield of Indian Jat indicated that yield was lost by tipping higher than 4 inches. A similar experiment which was laid down in a China Jat garden on Ruo Estate in 1941, met with a misadventure and was restarted in 1944. The layout was a randomised block design with 6 treatments replicated 6 times. Fortnightly records of leaf yields were made. The treatments were as follows :—

(1) Cut across and tipped at 2 inches.
(2) Cut across and tipped at 4 inches.
(3) Cut across and tipped at 6 inches.
(4) Clean pruned and tipped at 2 inches.
(5) Clean pruned and tipped at 4 inches.
(6) Clean pruned and tipped at 6 inches.

YIELDS FROM FORTNIGHTLY RECORDINGS, 1946–1947 SEASON

Treatment No.	1	2	3	4	5	6	*Sig. difference* $P=0.05$	$P=0.01$
Yield per acre in lbs. made Tea ...	548	537	524	573	498	462	67	—

Results.

During the previous two seasons no significant difference between treatments was obtained. The results of the 1946–47 show that treatments 1, 2, and 4, were significantly better than 6, and treatment 4 significantly better than 5. Treatment 4 (2 inch tipping on clean pruned tea) continued to show the highest yield.

Discussion.

Results so far show that crop is lost by tipping higher than 2 inches in the case of clean pruned China Jat tea. There is no significant difference between the three levels of tipping on cut across pruned tea, but there are indications that the same trend applies, i.e. yield is reduced by higher tipping levels as in the case of clean pruned tea. There are indications in this experiment and in experiment No. 1 that tipping at more than 4 inches reduces yields.

3. Treatment of Young Tea 1942. Mlanje Exp. Station.

This experiment was planted in March, 1942, to investigate different methods of bringing young tea into bearing. The layout was a 6×6 latin square and the initial treatments were as follows :—

(1) At twelve months to eighteen months after planting the young plants were centred (i.e. the central main stems were removed to encourage the bush to spread). The bush was cut level at 14 inches, tipped to 27 inches and then plucked.

(2) From nine months onward the young plants were lightly plucked, the bush was pruned at thirty months for the first time.

(3) The bush was cut across to 14 inches at eighteen months, tipped at 27 inches, and then up-pruned 2 inches yearly and tipped at 4 inches above pruning level.

(4) The bush was cut across to 8 inches at eighteen months, tipped at 27 inches, and then pruned to 14 inches at thirty months.

(5) The bush was cut across to 16 inches at eighteen months, left two years, and then up-pruned 2 inches yearly.

(6) The bush was allowed to grow for two and a half years and then pruned at 14 inches and up-pruned 2 inches yearly.

Yields.

Treatment No.	1	2	3	4	5	6	*Sig. difference* $P=0.05$	$P=0.01$
Yield per acre in lbs. made tea								
1946–47	691	735	698	666	738	700	None	None
Total Yield per acre in lbs. made tea								
1942–47	1,576	1,765	1,678	1,547	1,711	1,415		

Results.

As was the case during the preceding season there was no significant difference between treatments. Treatments 2 and 5 do however continue to give the best developed bushes and greatest spread.

Discussion.

Results to date indicate that irrespective of pruning methods applied to bring young tea into bearing the yield after a period of 4 years is likely to be the same.

Treatments 2 and 5 can be regarded as superior because they encourage the spread of the bush and thus provide greater soild protection. The system of allowing unlimited growth for $2\frac{1}{2}$ years before pruning has nothing to commend it. Observations on this experiment indicate that young tea responds to hard treatment.

4. Spacing of Tea 1941. Mlanje Exp. Station.

This experiment was planted in 1941 to investigate the optimum spacing of tea. The layout was a randomised block design with 4 treatments replicated 4 times, the treatments being as follows :—

(1) $3\frac{1}{2}$ feet by $3\frac{1}{2}$ feet.
(2) 4 feet by 4 feet.
(3) $4\frac{1}{2}$ feet by $4\frac{1}{2}$ feet.
(4) 5 feet by 5 feet.

Yield records 1946–47 season.

Treatment No.	1	2	3	4	*Sig. difference* $P=0.05$	$P=0.01$
Yield per acre in lbs. made tea ...	1,578	1,362	1,272	1,194	161	232

Results.

This experiment has shown that closer spacing give higher yields. The closest spacing in this experiment $3\frac{1}{2}$ feet by $3\frac{1}{2}$ feet has been consistently the best.

5. Investigations of different methods of pruning and extending the pruning cycle. 1938 Mlanje Exp. Station.

This experiment was devised to compare methods and frequency of pruning suitable for Indian Jat tea. In 1944, after 6 years of trials, it was concluded that the yearly pruning significantly reduced the yield of made tea, when compared with extended pruning cycle tea. The experiment has been continued. The layout is a 6 by 6 latin square and the treatments as follows :—

(1) Clean prune, every year.
(2) Cut across, every year.
(3) Cut across, with centre cleaned out, every year.
(4) Clean prune 1945 and unpruned 1946 (2 years cycle).
(5) Cut across 1945 and unpruned 1946 (2 years cycle).
(6) Clean pruned 1944, unpruned 1945 and 1946 (3 years cycle).

Yields for 1946–47 season.

Treatment No.	1	2	3	4	5	6	*Sig. difference* $P=0.05$	$P=0.01$
Yield per acre in lbs. of made tea	1,398	1,233	1,130	1,327	1,051	1,010	166	227

Results.

The difference in yields are highly significant. Treatment 1 and 4 are significantly better than 3, 5 and 6, and 3 is better than 5 and 6 at the P=0.01 level of significance.

There is no significant difference between treatments 1 and 4.

Discussion.

This investigation has now completed three cycles of 3 years each.

The results from the first 3 year cycle (4–6 years old tea) showed that the cut-across treatment 2 and cut-across with centre cleaned out treatment 3 gave significantly higher yields than clean pruned treatments.

In the second year of the first cycle treatments 2 and 3 again gave significantly higher yields than clean pruned tea on treatment 1. The unpruned tea cut across the year before or treatment 5 gave a significantly greater yield than yearly clean pruned tea treatment 1. The third year of the first cycle showed the same results, except that treatment 6, clean pruned tea, left unpruned for the three years of the cycle, gave higher yields than clean pruned tea on treatment 1. A good spread of bush completely closing the rows was obtained on treatments 2, 3, 5 and 6.

During the second cycle of the experiment (8–10 years old tea) similar results were obtained, a 20 per cent increase in yield was obtained from the extended cycle treatments and highly pruned (cut-across) treatments over the traditional annual clean pruning treatment 1.

The third cycle (11–13 years old tea) was concluded in 1947. During the first year of this cycle there was no significant difference between the annual and two year pruning cycle treatments 1, 2, 3, 4, and 5. Treatment 6, the 3 year cycle clean prune treatment, was significantly better than all treatments except 4. During the second year of cycle 3 there was no significant difference between treatments 1, 4 and 6. Treatment 4 gave a significantly higher yield than treatments 2, 3 and 5. Treatment 6 gave a significantly higher yield than treatment 5. Results for the last year of cycle 3 are given above.

This experiment indicates that on tea up to ten years of age highest yields are obtained from cut-across treatments, and that extended pruning cycles result in higher yields being obtained. Yields were definitely reduced by annual clean pruning, subsequently on older tea clean pruning gave higher yields than was obtained from cut-across tea. There are also indications that both annual and 2 yearly clean pruning treatments will give higher yields than the 2 year cycle cut-across and the 3 year cycle clean prune treatments.

The total yields obtained from treatments for the 9 years of the experiment indicate that annual clean pruning of Indian Jat tea depresses yields.

6. Cultivation Experiment 1941 Mlanje Exp. Station.

The object of this experiment was to investigate methods of controlling weeds and their effect on the yield of tea. The layout was a randomised block design with the following 6 treatments replicated 5 times.

(1) Hand weeding.
(2) Weeds slashed down.
(3) Weeds hoed and carried off.
(4) Weeds hoed and buried.
(5) Weeds hoed and left on surface.
(6) Left unweeded.
(7) Indigofera and Desmodium cover.

Yields for 1946–47 season.

Treatment No.	1	2	3	4	5	6	7	*Sig. difference* $P=0.05$	$P=0.01$
Yield in lbs. per acre of made tea	1,108 ...	1,084 ...	1,243 ...	1,148 ...	1,023	944 ...	1,144 ...	139	189

Results.

Results during previous years have indicated that cultivation to suppress weeds may not be necessary to obtain maximum yields, and that in some years it may be detrimental to the tea.

During the year under review for the first time the unweeded plots treatment 6 gave significantly lower yields than all treatments except 5. It is possible that since the weeds on treatment 6 have been allowed to grow through the tea and interfere with plucking, the reduction in yield might be due to inefficient plucking.

The conclusion of previous years holds good that provided weeds are kept below the plucking surface, cultivation of tea is not so essential for obtaining maximum yields.

7. Time of application of fertilisers to tea 1937 Mlanje Experimental Station.

Objects.

To measure the effect of applying fertilisers to tea at different times of the season. The application per acre was Superphosphate 140 lbs. Sulphate of Ammonia 170 lbs. Muriate of Potash 21 lbs.

Treatments.

1. Whole application of fertilizer applied during first week of November
2. Whole applied during first week of January
3. Half applied during first week of November
   ,, ,, ,, ,, ,, ,, January
4. ,, ,, ,, ,, ,, ,, November
   ,, ,, ,, ,, ,, ,, March

Layout.

A randomized block, 4 blocks of 4 treatments.

Yields for 1946–47 season.

Treatment No.	1	2	3	4	*Sig. difference* $P=0.05$	$P=0.01$
Yield per acre in lbs. of made tea	1,602	1,634	1,642	1,730	None	None

Results.

There was no significant difference between treatments, though once again treatment 4 gave the highest yield.

8. Vegetative Propagation Trial 1945 Mlanje Exp. Station.

From leaf cuttings obtained from 16 selected parent bushes 170 tea plants were raised in the nursery, and planted out during the rains. None of these plants survived the succeeding dry season. They were planted late in the rains after the most favourable planting time, but the complete lack of survival indicates that more than normal care is required if plants raised from cuttings are to be planted as stumps. Similar results were obtained in Ceylon, reference *Tea Quarterly Journal of Ceylon*, July, 1947 page 67.,

Experiences so far with the single node leaf cutting system of propagation, emphasises the specialized nature of this work in all stages of management from the time of selection up to establishing a plant in the field.

The superiority of tea plants raised in this way, over normal seedling plants is recognised, but the special care and improved technique required for raising and establishing plants by vegetative propagation appears to preclude it as a method of propagation for general application.

FOOD CROPS

Port Herald and Makanga (Chiromo) Stations.

AGRICULTURAL OFFICER IN CHARGE, M. V. ROSE

1. Organic Manurial and Mulching Experiment 1945 Makanga.

The experiment is of randomised block design and contains 6 replications of the following 5 treatments :—

1. *Dug.* The maize stalks from the previous crop were spread evenly over the field and the field dug at the end of July, the maize stalks being buried in the process.

2. *Bare fallow.* The plots were cleaned at the end of July, removing all stalks and weeds, and the plots left completely bare.

3. *Mulched.* Maize and cotton stalks from these plots and maize stalks from treatment (2) spread evenly over the plot.

4. *Unweeded.* Plots not weeded for a month before harvesting, and maize and cotton stalks left on the plot as mulch.

5. *African style.* Field cleaned at the end of October then left bare.

The indicator crop for the 1947 season was maize, the yields are recorded as maize on the cob.

Yields.

Treatment No.	1	2	3	4	5	*Sig. difference* $P=0.05$	$P=0.01$
Yields in lbs. per acre	2,554	2,416	2,995	3,633	3,196	492	—

Results.

There was no significant difference between treatments 1 and 2, or between treatments 4 and 5, 1 and 3.

Treatment 4 is better than treatments 1, 2, and 3
„ 5 „ „ „ „ 1 and 2
„ 3 „ „ „ „ 2

Heavy mulching treatment 4 is therefore the only treatment better than the control treatment 3 and the control is better than light mulching treatment 2.

The burying of plant refuse treatment 1 and inter-cropping with pigeon peas treatment 5, did not have any depressing effect on yields.

Discussion.

This experiment indicates that soil cover during the dry season is of importance in maintaining soil fertility. Early preparation of gardens unless followed by mulching to provide soil cover during the dry season, to replace the weed cover which is discouraged by early garden preparation, would appear to be a disadvantage.

The native method of leaving land undisturbed until just prior to planting time, would thus appear to be sound. The possible long-term effect of destroying organic matter by burning is not yet apparent.

During the 1946 season the burial of plant refuse in June and intercropping with pigeon peas appeared to reduce yields, these results were not repeated in 1947 possibly due to the higher rainfall received during 1946 than 1945.

2. Maize Sesame Interplanting 1947, Makanga.

Objects.

To investigate the possibility of growing maize and sesame as mixed crops.

Treatments.

1A	Maize	3′×1½′	2	plants	per	hole.	Sesame	planted	mid	December		
1B	,,	,,	,,	,,	,,	,,	,,	,,	,,	January		
1C	,,	,,	,,	,,	,,	,,	,,	,,	,,	February		
2A	,,	3′	,, 2′	3	,,	,,	,,	,,	,,	,,	December	
2B	,,	,,	,,	,,	,,	,,	,,	,,	,,	,,	January	
2C	,,	,,	,,	,,	,,	,,	,,	,,	,,	,,	February	
3A	,,	3′	,, 3′	4	,,	,,	,,	,,	,,	,,	December	
3B	,,	,,	,,	,,	,,	,,	,,	,,	,,	,,	January	
3C	,,	,,	,,	,,	,,	,,	,,	,,	,,	,,	February	
4A	,,	3′	,, 3′	Unthinned	,,	,,	,,	,,	,,	,,	December	
4B	,,	,,	,,	,,	,,	,,	,,	,,	,,	,,	January	
4C	,,	,,	,,	,,	,,	,,	,,	,,	,,	,,	February	

Layout.

A factorial experiment, 5 blocks, each with 12 plots.

Notes.

The whole field was ridged at 3 foot intervals, the maize was planted on top of the ridges and the sesame in the furrow. Owing to unfavourable weather the actual sesame planting dates were :—

A. December 30th 1946
B. February 3rd 1947
C. March 8th 1947

YIELDS IN LBS. OF UNTHRESHED PODS

	1			2			3			4			*Sig difference*	
Treatments	*A*	*B*	*C*	*A*	*B*	*C*	*A*	*B*	*C*	*A*	*B*	*C*	*P*=0.05	*P*=0.01
Yields in lbs. per acre ...	78.65	130.1	64.39	83.08	79.21	60.87	116.8	141.4	63.17	121.3	141.1	148.2	39.79	None

YIELDS FOR SOWING DATES ; THRESHING OUTTURN 35.6%

Treatment	*A*	*B*	*C*	*Sig. difference* *P*=0.05	*P*=0.01
Yields in lbs. per acre ...	99.74	122.96	84.15	39.82	None

Pure stand Sesame planted on the same field yielded as follows :—

Sowing date A. 193.6 lbs. per acre
,, ,, B 145.2 ,, ,, ,,
,, ,, C 38.7 ,, ,, ,,
} threshing outturn 47.4%

YIELDS OF SESAME AS AFFECTED BY MAIZE SPACING

Maize spacing	3′×1½′	3′×2′	3′×3′	*Sig. difference* *P*=0.05	*P*=0.01
Yields of sesame in lbs. per acre ...	91.05	74.40	106.83	39.82	None

YIELDS OF MAIZE ON THE COB

	1	2	3	4	*Sig. difference*	
Maize spacing	3′×1½′	3′×2′	3′×3′	3′×3′	*P*=0.05	*P*=0.01
Yields in lbs. per acre... ...	944.1	1,020.4	1,020.4	1,063.5	244.7	None

Results.

There was no significant difference between different sowing dates. Sesame planted between maize spaced at 3′×3′ and thinned yielded better than sesame planted between maize spaced at 3′×2′.

There was no significant difference between yields of maize from different spacings.

The interaction between date of planting and spacing did not give any significant difference.

Discussion.

The season was unfavourable for sesame, but the results indicate that interplanting maize crops with sesame might be an economic propostion. The investigation will be continued during 1948.

Maize—Groundnut Interplanting Experiment. Makanga.

Objects.

This experiment continues the investigation commenced by Messrs. Pearson and Mitchell of the E.C.G.C. to investigate the possibility of interplanting maize with groundnuts.

Treatments.

1. Maize 3′×2′ 2 plants per hole, 3 rows of groundnuts 6″×6″ planted in the furrow between ridges.
2. Maize 3′×3′ 3 plants per hole, 3 rows of groundnuts planted on ridges between the maize plants.
3. Maize 6′×2′ (i.e. on alternate ridges) 4 plants per hole 6 rows of groundnuts spaced 6″×6″ on alternate ridges.

The main plots were divided into 3 sub-plots to provide for three planting dates for groundnuts.

A. Maize and groundnuts planted on the same day.

B. Groundnuts planted two weeks after maize.

C. Groundnuts planted four weeks after maize.

Notes.

On earlier experiments bunch type groundnuts were used, these consistently failed to give satisfactory yields. For the 1947 experiment a spreading variety of groundnuts was used in the hope that a slower maturing variety might give better yields.

YIELDS MAIZE ON THE COB

Treatment No.	1	2	3	*Sig. difference* $P=0.05$	$P=0.01$
Yield of maize in lbs. per acre ...	1,399	1,405	1,176	277.5	—

A number of plots on all treatments failed to produce any crop of groundnuts, the data was therefore not analysed. Yields of unshelled nuts are recorded in the following table.

	Spacing			*Spacing date*		
Treatment	1	2	3	*A*	*B*	*C*
Yields in lbs. per acre	47.8	38.6	59.7	107.0	47.1	16.2

Results.

The maize spacing treatments gave no significant differences, nor was there any difference due to interaction between spacing and planting date.

Yields of groundnuts were better than during the previous season, but were again very low. The season was unfavourable for groundnuts and the later sown plots were infected with Rosette disease.

4. Organic Manure Experiment 1940–41 Port Herald.

The objects of this experiment, which is being conducted at Port Herald, are ; firstly, to determine the effect of compost on crop yield, and, secondly, to compare the burying of crop residues soon after harvest with the African practice of burning all crop residues just before preparatory cultivation of gardens begins. It is a randomised block trial with 8 replications of the following four treatments :—

1. Compost at the rate of 30 tons per acre applied in October.
2. Stalks from the previous crop composted and applied one month before planting, i.e. early November. This gave an application of approxiamtely 10½ tons per acre.
3. All plant refuse buried as soon after harvest as possible.
4. Plant refuse collected and burnt in October, immediately before garden preparation.

YIELDS OF SORGHUMS UNTHRESHED HEADS

Treatment No.	1	2	3	4	*Sig. difference* $P=0.05$	$P=0.01$
Yield in lbs. per acre	1,675.6	946.8	454.9	1,068.4	402.5	

Results.

The yield from kraal compost treated plots treatment 1 was better than all other treatments.

Discussion.

It is possible that the failure of the composted refuse to improve yields was due to its long exposure prior to application. There is reason to suppose that the low yield from plots in which plant refuse was buried is due to two factors, firstly the breaking down of cellulose causes nitrogen starvation, and secondly in burying plant residues the soil cover is removed resulting in the soil being exposed during the dry season.

OBSERVATION PLOTS—S. PROVINCE

TOBACCO

Burley Tobacco. Both Petauka and Haranova varieties were planted late. The leaf produced was of fair quality, but cured out on the dark side. It has been demonstrated that Burley tobacco can be grown satisfactorily, but conditions for curing in Chiradzulu, Mlanje and Namweras are not dependable.

Turkish Tobacco. The leaf again cured out dark at all trial centres except Lisungwe. At other centres neither the soil nor climate are considered suitable for this type of tobacco.

SUGAR CANE

A number of observation plots are being established in the vicinity of the Tuchila River, Mlanje District. Work to-date has been confined to building up stocks of adequate planting material to establish reasonable sized plots.

RICE

Variety and planting method observation plots were planted at Mpinganjila on the West side of the Lake Pamalombe in Fort Johnston District. The season was a difficult one due to dry spells during January and February.

Observations are briefly recorded below :—

1. Transplanting appears to produce better yields than direct seeding, for Faya and Bungara varieties. Demarara Creole gave the reverse result, perhaps due to the late arrival of seed which seriously delayed planting.
2. Early planting gave better results than later sowings.
3. Quicker maturing varieties (160–175 days) invariably gave higher yields than long term types such as Faya and Bungara (190–195 days)
4. Yields in the neighbourhood of from 500–700 lbs. per acre during a very adverse season seem to indicate that rice might be successfully grown at Mpinganjila during normal seasons.

At Nyambi situated on higher land between Lakes Pamalombe and Chiuta in Fort Johnston District, observation Plots were planted similar to those at Mpinganjira. The season was very unsuitable to rice growing and no satisfactory observations could be made.

As in the case of the plots referred to above the earlier maturing varieties appeared to be most promising.

Yields from the 1946–47 Trials are Recorded below

PADDY TRIALS—MPINGANJIRA

Variety Nos.	*Plot*	*Date Ptd.*	*Date traptd.*	*Date harvt.*	*Yield per acre lbs.*	*Period Days*
Faya ...	8	14–11–46	30–1–47	22–5–47	397	189
	9	14–11–46	2–2–47	24–5–47	400	191
	10	15–11–46	direct sowing	27–5–47	217	193
Demarara	6	30–12–46	30–2–47	10–5–47	127	162
Creole	1	27–12–46	direct sowing	15–5–47	307	170
	2	27–12–46	,,	16–5–47	160	171
Bungara	12	16–11–46	9–2–47	30–5–47	117	195
	11	16–11–46	direct sowing	28–5–47	50	193
Maji Maji	3	29–12–46	30–1–47	19–5–47	100	172
Macheusana	5a	14–12–46	30–1–47	2–5–47	680	169
Likoti	5b	14–11–46	1–2–47	9–5–47	475	176
Burma	7a	20–11–46	5–2–47	3–5–47	493	164
Caluwa	7b	20–11–46	6–2–47	3–5–47	560	164

PADDY TRIALS—NYAMBI

Variety	*Plot Nos.*	*Date Ptd.*	*Date traptd.*	*Date harvt.*	*Yield per acre lbs.*	*Period Days*
Faya ...	1	1–11–46	15–1–47	1–6–47	331	216
Maje Maji	2	2– 1–47	15–2–47	30–6–47	239	169
Demarara	3	2– 1–47	15–2–47	1–7–47	640	170
Afaamwanza	4	2– 1–47	1–3–47	12–7–47	350	182

Millets

Pennisetum sp. two varieties. Long Headed and Awned were selected from a crop grown during the previous season raised from seed imported from Tanganyika. Both varities are vigorous growers and the awned variety is very bird resistant, the yield however was disappointingly low due to an attack by a fungus disease. This crop does not appear to be suitable for higher altitudes with high rainfalls.

Grasses

Agrostis tenuis. This lawn grass developed a tufted habit of growth and does not appear suitable for high altitudes.

Eragrostis Tehmannia a good soil-binding low-growing grass. It is however unable to compete with indigenous weeds and is gradually dying out.

Eragrostis curvula is a most promising grass, it can be readily propagated by seed or " sets." Might be suitable for use in soil conservation work for gully control.

Bromus inermis a broad-leafed fodder grass which has grown well, but it does not appear to be able to compete with local vegetation, and unless weeded will not survive.

Pspalum notatum this can be readily established either by seeding or from "sets." Most useful grass for use in soil conservation work as it produces a dense mat of vegetation and roots. It is also a useful pasture grass, and might be used for establishing permanent pastures.

Giant Rhodes Grass (*Chloris gayana*) this is a vigorous-growing free-seeding grass suitable for grazing of hay-making. Further trials with this grass under a wider range of conditions will be inaugorated.

Panicum makarikariensis a vigorous growing broad-leafed grass, which strikes at all nodes. This grass is said to be a drought resistant type particularly suitable as a pasture-grass on dry sandy areas.

Pennisetum purpureum (Uganda strain) this is a strong-growing deep-rooted type much more vigorous than local strains. It produces a large bulk of fodder suitable for stall feeding.

Clovers

Trifolium subterraneum. Two varieties (*Bachus March and Early Devalgonup*) of this clover have been planted in observation plots. Bachus March variety died out during the first season. Early Devalgonup has grown fairly well, has produced seed and is quite promising.

MISCELLANEOUS CROPS

Lespedesa sericea at Chirimba and other centres failed to produce satisfactory growth, and does not appear to be a suitable crop for use in Nyasaland.

CENTRAL AND NORTHERN PROVINCES

ACTING SENIOR AGRICULTURAL OFFICER, C. J. DAWKINS

EXPERIMENTAL AND OBSERVATION WORK. NCHEU AND DEDZA DISTRICTS

AGRICULTURAL OFFICER, D. H. LAYCOCK

WHEAT

1. Wheat Variety Trial. Gochi.

Objects. To test the relative merits of 7 varieties on the Kirk Range.

Layout.

Random blocks. 8 blocks with 7 plots in each.

Treatments	*Yield per acre*
261.5.10 C.I.A.	1,881 lbs.
C.T.I.	1,463 ,,
261 R.Y.C.I.B.	1,306 ,,
Matoposi	1,149 ,,
Granadere klein	1,045 ,,

Results.

There was no significant difference between varieties.

2. Wheat Variety Trial. Mwalawankhondo.

Objects.

To test the relative merits of a number of varieties of wheat in Dedza District.

Treatments	*Yields in lbs. per acre*
261. R.Y.C.I.B.	1,250 lbs.
Dedza mixture	1,250 ,,
Matoposi	1,100 ,,
Grandero klein	1,100 ,,
C.T.I.	900 ,,
261.5.10 C.I.A.	900 ,,
Vorentoe	850 ,,

Results.

There was no significant difference between varieties.

3. Wheat Observation Plots.

Object.

To record length of growing season.

Variety	*Days to harvest*
Kenya Governor	147
Kruger	199
U. 52	152
Pusa	152
C.T.I.	155
261 R.Y.C.I.B....	159
261.5.10 C.I.A	162
Matoposi	163
Koalisi	167
Sabanero	169
Vorentoe	172
Granadero klein	176

POTATOES

4. Variety Trial Biriwiri.

Object.

To test the relative yielding capacity of three local varieties.

Layout.

Latin Square.

Treatments	*Yields lbs. per acre*
Bembeke	4,514
Chinthonje	3,320
Ulaya	1,540

Results.

The differences are not significant.

5. Soil Erosion Plots. Nkande.

Objects.

To measure the relative rate of erosion from grass land treated in different ways.

Treatments.

1. Early burn
2. Late ,,
3. Unburned.

NOTES.

Observations extended over a period of six months, and will be continued.

LIKUNI EXPERIMENTAL STATION, LILONGWE

AGRICULTURAL OFFICER, C. J. DAWKINS

1. Maize Shelling Measurments.

Object.

To find out whether grain to cob ratio varies according to size of cob.

Method.

Samples of cobs were collected and grouped for size into 12 classes, each class being represented by 50 cobs.

RECORDS

Group No.	*Av. Wt. of cob with leaves*	*% ratio of Grain to Cob with leaves*	*% ratio of Grain to Cob without leaves*
	Ounces	%	%
1 ...	7.2 ...	78.0 ...	86.2
2 ...	6.2 ...	78.1 ...	86.4
3 ...	5.5 ...	77.4 ...	85.1
4 ...	5.0 ...	79.6 ...	85.5
5 ...	4.5 ...	78.8 ...	85.0
6 ...	4.1 ...	76.0 ...	85.0
7 ...	4.0 ...	75.0 ...	85.8
8 ...	3.3 ...	77.3 ...	85.3
9 ...	2.5 ...	70.9 ...	84.0
10 ...	2.3 ...	67.7 ...	81.9
11 ...	1.9 ...	67.8 ...	82.4
12 ...	1.5 ...	65.5 ...	80.2
Means ...	4.42 oz. ...	75.2% ...	84.2%

Results.

There was no significant relationship between size of cob and the ratio of grain to cob weights, and the tendency for the ratio to fall off with decreasing size of cob did not become pronounced until the cob weight was very low, say 3 ounces.

2. Dressing Tobacco for Seed Production. (Four Experiments).

A. FIRST EXPERIMENT

Object.

To test the seed-yielding efficiency of traditional practices in dressing tobacco for seed.

Treatments.

Main treatments { 1. Priming to 10 leaves (Traditional).
2. Leaving all leaves (say 20) (Natural).

Sub treatments { 3. Dressing panicle to " Ball " or " Crowsfoot " (Traditional).
4. Allowing free flowering (though removing " sucker " branches).

NOTE. No leaves in any treatment were harvested for curing, but all were allowed to wither on the plant.

Layout.

Four blocks containing two plots each, each plot being three contiguous and continuous tobacco ridges reaching from one side of the experimental field to the other (about 10 chains). These were the main treatments (1 and 2); for the sub treatments (3 and 4) random plants were treated within each main treatment plot.

Records.

Ten plants were taken at random from each sub treatment plot and clean seed obtained. Figures in the following table represent seed yields from these samples of ten plants each.

Main treatments	1		2	
Sub treatments	3	4	3	4
Blocks	(All yields given in ounces)			
1	7.6	11.6	8.0	11.8
2	7.0	11.5	8.7	12.6
3	7.6	11.8	9.0	13.5
4	7.2	8.7	8.7	11.2
Means	7.35	10.90	8.60	12.275
	9.125		10.44	

Results.

Leaving all leaves gave 14.3% better yield than leaving ten leaves only, significant at 5% level of probability.

Leaving a natural panicle increased yield by 45%, significant at 1% level.

Leaving both leaves and panicle increased yield by 67%.

B. SECOND EXPERIMENT

Object. As in A above.

Treatments. Only one pair, as 3 and 4 above; all were primed to 10 leaves.

Layout. As in A above, but no split plots.

Results. As in A; leaving a natural panicle gave 43% greater yield than pruning the panicle to Ball or Crowsfoot, significant at 5% level.

Remarks on Experiments A and B

It is quite clear that the current methods of dressing tobacco plants for seed production, namely priming many leaves in imitation of topping, and pruning the panicle to the traditional " ball " make for reduced weight of seed crop, but it would not be scientifically proper to discard the traditional method on this evidence alone, without testing the viability and vigour of seed produced by the different methods.

C. THIRD EXPERIMENT

Object. To attempt to separate heavy from light seed by immersion in water, and then to compare the above treatments for light seed content.

Method. Five thoroughly representative 25-gram samples were taken from the bulks of each treatment combination (i.e. 1.3, 1.4, 2.3, 2.4) and each of these twenty samples was separated into sinking seed and floating or near-floating seed.

An apparatus was devised which allowed the known weight of seed to be stirred into a fixed amount of water, and to settle for 120 seconds, and for a lesser fixed amount of water to be run off through a basal drain carrying with it the sinking seed. The latter was sun-dried and weighed.

Results. The data showed no significant difference between the four treatments.

They also showed however that water may not be a suitable medium for segregating light seed, because as a check the seed which had been discarded as floating was sun-dried and put through the apparatus a second time, and nearly all sank! (This does not of course deny the possibility that all the seed was homogeneously good).

D. Germination Test

A qualitative germination test showed no visible difference in viability or vigour between the four treatment combinations.

TOBACCO SEED DRESSING EXPERIMENTS DISCUSSION

It follows from these experiments that there is very good reason to question the efficacy of the traditional method of dressing tobacco plants for seed production, and to question the reasons for its universal adoption.

It is easy to understand why this method appeals to tobacco workers, because the "properly" dressed plant looks very much like a normally topped tobacco plant and therefore pleases the tobacco-trained eye; whereas the plant left to nature is straggly, with comparatively (albeit naturally) short and thin leaf (therein belying to its genetic constitution), and far from pleasing the tobacco-trained eye.

There is a strong argument that priming to a few leaves allows seed plants to produce curable leaf; but obviously to harvest any such leaf is to deprive any as yet unripe seeds of some of their means of ripening; and to do so would cause the later-formed seeds (chiefly in suckers and the tips of lower panicle branches) to be unfilled, that is light, not vigorous, or perhaps not viable seed. Thus the common practice of curing leaves of seed plants may be an origin of the popular belief that sucker seed is bad; especially as seed in the unnaturally produced ball-heads is normally fully ripe and dried out while the leaves are still curable.

There is certainly no possibility of truth in the popular belief that seed from suckers or from lower branches of the panicle produces throw-backs to undesirable type of tobacco, say narrow leaf.

There is however a second strong argument that the typical tobacco grower needs only to keep a very small number of seed heads to supply all his needs; he need not therefore go for high seed yield but can permit himself a cash return in the shape of cured leaf, as well as seed, from his few selected plants.

From the selector's point of view the implicit danger in either method is whether one can select the genetic type required (which must respond to topping) without actually doing the topping; and in this respect the "natural" method is one stage more difficult than the traditional. But on the other hand the genetic population of tobacco in Nyasaland is so mixed that this distinction is too refined to be limiting.

These arguments render the demonstrated fact that yields can be increased by as much as 67% (or in other words that acreage, using the same standard of selection, can be reduced by over 40%), overwhelmingly important in tobacco seed farms, such as those of this Department, where the amounts required run into tons per year.

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